We claim:

1. A detector for varying pressure ranges in a specimen chamber of a particle beam device, wherein the detector is arranged and adapted for detection of electrons and light.

2. The detector according to claim 1, wherein the detector comprises a scintillator to which a high voltage potential is appliable, and a photodetector, the scintillator being at least partially permeable to light.

3. The detector according to claim 2, wherein the scintillator comprises an electrically conductive coating in grid or strip form.

4. The detector according to claim 2, wherein the scintillator comprises an electrically conductive coating that is permeable to light.

5. The detector according to claim 1, further comprising a light guide.

6. The detector according to claim 5, wherein the light guide comprises scintillator material.

7. The detector according to claim 2, further comprising a collector electrode connected before the scintillator.

8. The detector according to claim 7, wherein the scintillator and the collector electrode are controllable potentials, independently of each other.

9. The detector according to claim 7, wherein the collector electrode is arranged and adapted for application of a variable potential, positive with respect to the sample potential.

10. The detector according to claim 7, wherein the scintillator comprises a conductive coating, further comprising current amplifiers that are connected to at least one of the collector grid and to the conductive coating of the scintillator.

11. The detector according to claim 8, wherein the conductive coating of the scintillator is arranged and adapted to have a potential applied with respect to the collector electrode so that a gas cascade arises between the collector electrode and the conductive coating.

12. The detector according to claim 1, further comprising a needle electrode or an electrode of thin wires on a sample side of the scintillator.

13. The detector according to claim 1, further comprising a scintillator and an electrode surrounding the scintillator in a form of a pot that tapers conically to a point on a side remote from the scintillator and comprises an opening on a side remote from the scintillator.

14. A particle beam device, particularly a scanning electron microscope, comprising a sample chamber, with a variable pressure, an electron optical system for production of a focused electron beam (PE) and a detector according to claim 1.

15 . The particle beam device according to claim 14, further comprising a pressure meter in the sample chamber so that the application of potential to the scintillator takes place in dependence on the pressure in the sample chamber.

16. The particle beam device according to claim 15, that is arranged and adapted so that at pressures in the sample chamber below a changeover pressure between 10^{-3} hPa and 10^{-2} hPa, a potential of greater than 1 kV positive with respect to the potential of the sample is applied to the scintillator, and at pressures in the sample chamber above the changeover pressure, a potential quantitatively smaller than 1 kV, preferably smaller than 0.5 kV, positive with respect to the potential of the sample is applied to the scintillator.

17. The particle beam device according to claim 15, wherein the sign of the potential of the collector electrode is reversible.

18. The particle beam device according to claim 16, that is arranged and adapted so that at pressures above the changeover pressure in the sample chamber, a potential of 0 V or ±400 V with respect to the potential of the sample is applied to the collector electrode.

19. A method for the detection of the products of reciprocal effects in a particle beam device under variable pressure conditions, comprising the step that under high vacuum conditions the light arising when the products of interaction strike a scintillator, and the step that at ambient pressure or low vacuum conditions, the light arising when the products of interaction interact with gas molecules, are detected with the same photodetector and then evaluated.

20. The method according to claim 19, comprising the step of using a detector according to claim 1.

21. The particle beam device according to claim 16, wherein the potential is quantitatively smaller than 0.5 kV.